

REMARKS

Claims 1-2, 5, 7-9, 11 and 13-43 are all the claims presently pending in the application. Claims 7-8, 13-14, 16, 18, 10, 23, 26, 31 and 34 have been withdrawn from prosecution. Claims 1-2, 5, 9, 11, 16-20, 22-23, 25-26, 28-30, 32-33, 35-36 and 38-40 have been amended to more clearly define the invention. Claims 1, 39 and 43 are independent.

Applicant gratefully acknowledges that claim 43 is allowed. Applicant respectfully submits that all of the pending claim are allowable.

It is noted that the claim amendments are made only for more particularly pointing out the invention, and not for distinguishing the invention over the prior art, narrowing the claims or for any statutory requirements of patentability. Further, Applicant specifically states that no amendment to any claim herein should be construed as a disclaimer of any interest in or right to an equivalent of any element or feature of the amended claim.

Claims 1-2, 5, 9, 11, 15, 17, 19, 21-22, 24-25, 27-30, 32-33 and 35-42 stand rejected under 35 U.S.C. § 112, second paragraph as being indefinite. Applicant notes that there are no prior art rejections with respect to the pending claims. Therefore, presumably, overcoming the informalities will place all of the pending claims in condition for allowance.

The informality rejection is respectfully traversed in the following discussion.

I. THE CLAIMED INVENTION

The claimed invention (e.g., as recited in claim 1) is directed to a light-emitting semiconductor device including a substrate, plural semiconductor layers which are made of group III nitride group compound semiconductor formed on the substrate, and an active layer having a multiple quantum well structure.

Importantly, the multiple quantum well structure includes a plurality of quantum well layers which satisfy the formula $Al_{1-x}In_xN$, a composition ratio x of indium (In) being in a range of $0.1 \leq x \leq 1$, and at least one quantum barrier layer which satisfies the formula $Al_{1-z-y}Ga_yIn_zN$ ($0 \leq y \leq 1$, $0 \leq z < 1$, $0 \leq z+y \leq 1$), alternately formed with the plurality of quantum well layers, a composition ratio y of gallium (Ga) in the at least one quantum barrier layer being one of $y=1$, $y \approx 1$, and $0.9 < y \leq 1$.

Conventional light-emitting semiconductor devices may include a multiple quantum well (MQW) structure having well layers formed of $GaInN$ and barrier layers formed of GaN .

However, such conventional devices experience problems. Specifically, in such devices, the performance life is short and the driving voltage (e.g., oscillation threshold) is high.

The claimed device, on the other hand, includes an active layer having a quantum well structure which includes a plurality of quantum well layers which satisfy the formula $Al_{1-x}In_xN$, a composition ratio x of indium (In) being in a range of $0.1 \leq x \leq 1$, and at least one quantum barrier layer which satisfies the formula $Al_{1-z-y}Ga_yIn_zN$ ($0 \leq y \leq 1$, $0 \leq z < 1$, $0 \leq z+y \leq 1$), alternately formed with the plurality of quantum well layers, a composition ratio y of gallium (Ga) in the at least one quantum barrier layer being one of $y=1$, $y \approx 1$, and $0.9 < y \leq 1$. With such a configuration, the claimed invention is able to provide a light-emitting semiconductor device which emits rays having a desired and useful wavelength (Application at page 12, lines 8-11), and is able to reduce the amount of indium needed to form the quantum barrier layer (Application at page 13, lines 8-13).

II. THE 35 USC 112, SECOND PARAGRAPH REJECTION

The Examiner alleges that claims 1-2, 5, 9, 11, 15, 17, 19, 21-22, 24-25, 27-30, 32-33 and 35-42 are indefinite. Applicant submits, however, that these claims particularly point out and distinctly claim the subject matter of the present invention.

Specifically, the Examiner alleges that claim 1 recites a "multiple quantum well structure" which implies more than one quantum well. Applicant notes that claim 1 has been amended to recite "a plurality of quantum well layers" to address the Examiner's concerns. Therefore, claim 1 is not indefinite and is in condition for immediate allowance.

The Examiner further alleges that in claim 39 the barrier layer is "alternately formed" with the quantum well layer. The Examiner alleges that this would require "more than one set of the two layers". Applicant respectfully disagrees.

Applicant notes that claim 39 recites (in part) "*at least one quantum barrier layer ... alternately formed with said quantum well layer*". Applicant respectfully submits that claim 39 may reasonably be construed as including one quantum well layer and one quantum barrier layer which is "alternately formed" with the quantum well layer. That is, the language "alternately formed" does not necessarily require "two sets" of layers as alleged by the Examiner, but may include "one set" of layers.

Indeed, Applicant notes that the term "alternate" is defined to mean "arranged one

above or alongside **the other**” (Webster’s Universal Encyclopedic Dictionary, Barnes & Noble Books, 2002, page 52)(emphasis added). Thus, the definition of alternate may include “one” and “the other” and, therefore, does not require any more than two of anything. That is, by definition, layers that are “alternately formed” may include two layers that are “arranged one above ... the other”.

Therefore, Applicant respectfully submits that claim 39 which recites:

“an active layer comprising:

at least one quantum well layer comprising $Al_{1-x}In_xN$, where $0.1 \leq x \leq 1$; and
at least one quantum barrier layer which satisfies the formula $Al_{1-z-y}Ga_yIn_zN$
($0 \leq y \leq 1$, $0 \leq z < 1$, $0 \leq z+y \leq 1$), alternately formed with said quantum well layer”,

is not vague as alleged by the Examiner. That is, Applicant submits that the term “alternately formed” is perfectly clear and is properly recited in the context of claim 39.

Therefore, contrary to the Examiner’s allegations, claim 39 clearly defines the subject matter of the invention and is not indefinite. Therefore, the Examiner is respectfully requested to withdraw this rejection.

III. FORMAL MATTERS AND CONCLUSION

In view of the foregoing, Applicant submits that claims 1-2, 5, 9, 11, 15, 17, 19, 21-22, 24-25, 27-30, 32-33 and 35-43, all the claims presently pending in the application, are patentably distinct over the prior art of record and are in condition for allowance. The Examiner is respectfully requested to pass the above application to issue at the earliest possible time.

Should the Examiner find the application to be other than in condition for allowance, the Examiner is requested to contact the undersigned at the local telephone number listed below to discuss any other changes deemed necessary in a telephonic or personal interview.


Serial No. 09/725,496
Docket No. F00-212-US

12

The Commissioner is hereby authorized to charge any deficiency in fees or to credit any overpayment in fees to Attorney's Deposit Account No. 50-0481.

Respectfully Submitted,

Date: 3/17/04



Phillip E. Miller, Esq.
Registration No. 46,060

McGinn & Gibb, PLLC
8321 Old Courthouse Road, Suite 200
Vienna, VA 22182-3817
(703) 761-4100
Customer No. 21254